

- Co-operate on research, development, and testing of next-generation mobile air conditioning systems that minimise environmental impact but still satisfy customer requirements and environmental, safety, durability, and reliability standards.
- Communicate technical progress to policy-makers and the public.

## The Partners

### *Organising Partners*

Society of Automotive Engineers, U.S. Environmental Protection Agency, and the Mobile Air Conditioning Society.

### *Government, Academic, Environmental, and Testing Partners*

Ecole des Mines de Paris, Environment Canada, Environment Directorate-General of the European Commission, International Organization for Standardization, Underwriters Laboratories, University of Braunschweig (Germany), University of Illinois (USA), U.S. Army, U.S. National Renewable Energy Research Laboratory, and World Resources Institute.

### *Corporate Partners*

Audi, Behr, Bergstrom, BMW, CalsonicKansei, DaimlerChrysler, Delphi Automotive Systems, Denso, Eaton, Freightliner, General Motors, Goodyear, Honda, Johnson Controls, Konvekta, Nissan, Neutronics, Parker-Hannifin, Sanden, Snap-On Diagnostics, Texas Instruments, Toyota, UView Ultraviolet Systems, Valeo, Visteon Corporation, Volkswagen, and Volvo Car Corporation.

### *For Additional Information*

SAE Web site: [www.sae.org/technicalcommittees/altrefrig.htm](http://www.sae.org/technicalcommittees/altrefrig.htm)

EPA Web site: [www.epa.gov/appdstar/information.html](http://www.epa.gov/appdstar/information.html)

EPA hotline: (800) 296-1996



*A global partnership is working to reduce the emissions of greenhouse gases from the use of motor vehicle air conditioning systems.*

# The Importance of Motor Vehicle Air Conditioning in Climate Protection



# The Mobile Air Conditioning Climate Protection Partnership

The Society of Automotive Engineers (SAE), the U.S. Environmental Protection Agency (EPA), and the worldwide Mobile Air Conditioning Society (MACS) are working with automobile companies, their suppliers, and environmental organisations to help protect the climate by reducing the impact that mobile air conditioning has on the environment. These partners are conducting public awareness activities, developing service procedures and guidelines for reducing the emission of refrigerants from the existing fleet of vehicles, improving systems used in new vehicles, and designing systems for the next generation of high-efficiency hybrid, electric, and fuel cell vehicles.

## *Cooling Cars with Less Environmental Impact*

Air conditioning has become a standard option on most vehicles, enhancing comfort and safety. Modern systems feature integrated cooling, heating, de-misting and de-frosting, air filtering, and humidity control. These systems improve passenger security by allowing windows to remain closed, improve driver alertness with temperature choice, and increase visibility by de-misting and de-fogging windows during inclement weather. Because consumers expect a high level of comfort and safety, energy-efficient air conditioning is considered vital for consumer acceptance of future electric, fuel cell, and hybrid vehicles.

Fuel combustion necessary to power current mobile air conditioners can result in increased vehicle exhaust emissions that affect local air quality and carbon dioxide (CO<sub>2</sub>) that is a greenhouse gas. Refrigerants in use today are also greenhouse gases that account for approximately 0.1 percent of global greenhouse gas emissions from all human activities, due to system leaks as well as losses during service and at vehicle end-of-life disposal.

# Partnership Strategies

## *Reducing CFC and HFC Refrigerant Emissions*

All vehicles built before 1991 used CFC-12 as the refrigerant, but by 1994 most new vehicles were manufactured using HFC-134a. CFCs deplete the stratospheric ozone layer and are also powerful greenhouse gases. The new HFC-134a refrigerant that replaced CFC-12 in vehicle air conditioning is safe for the ozone layer and is a much less powerful greenhouse gas. However, additional progress can be made by minimising HFC-134a emissions and investigating the environmental potential of other refrigerants.

Recovery and recycling of CFC-12 and HFC-134a refrigerants has been required by law in Japan, the United States, and many European Union and other countries. The Partnership promotes recovery and recycling of refrigerants during servicing and vehicle disposal, and the use of high-quality and durable components for new vehicles and as replacement parts during servicing.

## *Designing Vehicles to Need Less Cooling*

Engineers can reduce the amount of fuel use and emissions necessary to cool a vehicle by system and vehicle design that uses solar-reflective window glass, better compressor control, and lighter-weight components.

## *Developing New Air Conditioning Technologies*

New high-efficiency air conditioners are particularly critical to the success of hybrid, fuel cell, and electric vehicles that have little power to spare. Because the most efficient internal combustion engines now produce too little waste heat to warm passenger compartments, air conditioning systems might be designed like heat pumps to cool in summer and heat in winter if window fogging during the heating mode can be overcome.

Manufacturers are designing new systems with high cooling performance and reliability, operational and service safety,

environmental performance, and serviceability. Global co-operation under the Partnership will speed development and commercialisation with its test program and standards work.

Hydrocarbons and transcritical CO<sub>2</sub> refrigerants are under consideration as a replacement for HFC-134a. Prototype vehicles with hydrocarbon and carbon dioxide air conditioning have already achieved cooling and energy performance that is comparable to HFC-134a systems. Experimental electrically driven hermetic carbon dioxide air conditioning systems will soon be demonstrated in test fleet fuel cell vehicles.

Although these technical options are promising, it is too early to determine which of the options will be best for climate protection. Cost-benefit analysis will be used to identify air conditioning options with the highest environmental benefit and to contrast the advantages of that investment with other fuel-saving technology.

SAE has established the Alternate Refrigerant Co-operative Research Test Program to compare the environmental and performance benefits of the various refrigerant technologies. The industry is simultaneously developing new SAE/International Organization for Standardization (ISO) standards for the new systems.

## *Vehicle Owners Can Help Protect the Climate and the Fragile Ozone Layer*

In most countries, all new vehicle dealerships and many independent garages provide recycling as part of their commitment to environmental protection. Consumers should insist on recovery and the use of recycled refrigerants.

# Partnership Goals

The Mobile Air Conditioning Climate Protection Partnership was founded to:

- Document the current and near-future opportunities to improve the environmental performance of mobile air conditioning system design, operation, and maintenance.
- Promote cost-effective designs and improved service procedures to minimise greenhouse gas emissions from mobile air conditioning systems.